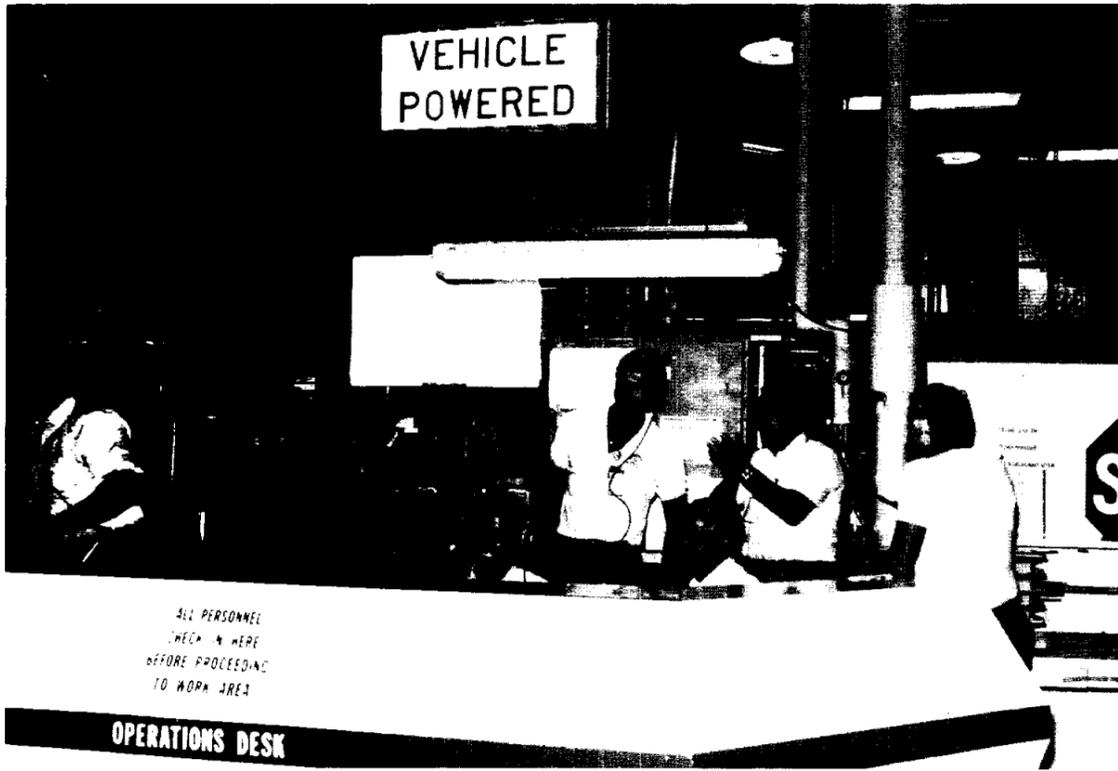


Space News Roundup

No. 26 Vol. 16

August 14, 1987

National Aeronautics and Space Administration



Smiles and applause emanate from the Orbiter Processing Facility at Kennedy Space Center as *Discovery* is powered up Aug. 3 to support processing for the launch of STS-26.

Shuttle recovery rounding corner on green light

Workers cheered when the words "VEHICLE POWERED" flashed on a sign outside *Discovery*, and optimistic NASA officials said that and other signs of recovery progress indicate the agency has rounded the corner as it prepares for the return to flight.

Kennedy Space Center officials said the Aug. 3 power-up beginning the first work to prepare an Orbiter for flight since the *Challenger* accident was a boost to employee morale and proved that NASA can set ambitious target dates and meet them.

"That may be the most significant point about this (power-up)," said KSC Launch Director Robert Sieck. "I think it indicates the capability in the program to meet the milestones we have established. We set this optimistic but makeable target date to power up the Orbiter and everybody worked to it and here we are."

At the same time, the JSC workforce saw encouraging signs of progress last week as a final go-ahead was given to Rockwell International for construction of a replacement orbiter (see related story), and the crew patch for STS-26 was unveiled.

Richard Colonna, manager of the Orbiter Project at JSC, expressed satisfaction at the progress JSC is making in the enormous task of making engineering changes

to the Orbiter design and recertifying the vehicles prior to STS-26.

About 94 percent of the engineering work required on the orbiter fleet before first flight has been completed, and 83 percent of the modification kits have been delivered, he said.

The "biggest driver" that remains, he said, is completion of the review and documentation process required.

After flights resume, he added, complete documentation detailing the rationale for hardware changes will be finished. Rationale documentation is not required for first flight, but is necessary to provide a historical record of the changes that were made, he said.

Sixty-four mandatory modifications required before STS-26 were identified in an extensive review

of the entire Orbiter system that began soon after the *Challenger* accident, he said. An additional 114 modifications were baselined, but were not considered mandatory. Colonna said, however, that most of the modifications would be made on *Discovery* before its scheduled June launch date.

JSC involvement in the orbiter recovery effort, he said, is extensive. About half of the JSC workforce is "working in some way or another on the return to flight," he said.

Much of the workforce at JSC is



Rockwell secures contract to build replacement Orbiter

The National Aeronautics and Space Administration has completed negotiations with Rockwell International, Downey, Calif., to build the replacement Space Shuttle Orbiter (OV-105).

Scheduled delivery date is April 30, 1991.

"The completion of these negotiations and the commencement of full production of this new orbiter mark a major milestone in our return to safe, reliable and effective space flight," said Rear Adm. Richard Truly, Associate Administrator for Space Flight. "Those government and contractor people who oversee and construct this spacecraft are setting out on a task which is of the

utmost importance to America's future in space."

JSC will manage the cost-plus-award/incentive-fee contract, which became effective Aug. 1 and has a target price of \$1.3 billion. Other elements required to complete procurement of the hardware lost in the STS 51-L accident include the Space Shuttle main engines, crew equipment and support services. These items were included as a part of the replacement funding provided by Congress at President Reagan's request in 1987, and will be acquired through separate procurement actions.

Under terms of the contract, Rockwell will fabricate, assemble,

test, check out and deliver the Orbiter within 45 months. Using existing structural spares, the new vehicle will feature the latest upgrades and modifications and will incorporate all new technology evolving from the current return-to-flight activities.

Management and some fabrication will take place at the contractor's plant in Downey. Additionally, it is anticipated that a significant percentage of the work will be performed by more than 100 subcontractors for components and support services. Assembly and checkout of the orbiter will take place at the Rockwell facility in Palmdale, Calif.

NASA funds advanced solid rocket motor studies

Marshall Space Flight Center recently awarded contracts to five aerospace firms for design and definition studies for an advanced solid rocket motor for the Space Shuttle.

The 9-month contracts, not to exceed \$3.3 million each, were awarded to Aerojet Solid Propulsion Co., Sacramento, Calif.; Atlantic

Research Corp. of Alexandria, Va.; Hercules Aerospace Co.'s Aerospace Division of Salt Lake City; Morton Thiokol Inc., of Brigham City, Utah; and United Technologies Chemical System Division of San Jose, Calif.

These same firms performed conceptual studies of alternative

solid rocket motor designs from September to December 1986.

Under the contracts, issued Aug. 7, the five companies will develop preliminary advanced solid rocket motor designs with supporting design analyses, conduct detailed design assessments to increase solid rocket motor reliability and performance and evaluate incre-

mental advanced motor changes that would permit Space Shuttle performance increases up to 12,000 pounds of payload.

The preliminary designs will include both a segmented motor design, like the current Shuttle motors, and a monolithic motor design, wherein the full-length motor case is assembled and the

propellant is cast without joints.

Based on the results of these studies, a decision will be made whether to pursue the design, development, test and production for an advanced motor beginning in fiscal year 1989. A decision to proceed would allow the advanced motor to be available for Shuttle flights in late 1993.

Quick action confines problems, speeds computer complex rebound

A water leak in Bldg. 30 forced an emergency power-down of the Data Computation Complex (DCC) on Aug. 6, but the facility began returning to normal just 24 hours later.

Mission Control Center personnel reported little damage to the first-floor computer equipment that supports Space Shuttle missions and simulations. Quick response by DCC workers who covered the computers with plastic sheeting was credited with keeping damage at a minimum.

A fitting on a chilled water line in the crawlspace between floors of the MCC/Mission Operations Wing was broken at 9:10 a.m. Thursday, Aug. 6, by workers installing cables into the space, said Gary Kane, MCC Facility Manager.

By 9 a.m. the next day, technicians began powering up the equipment and performing subsystem checks. On Saturday, subsystems were connected and inte-

grated tests were performed in both secure and non-secure modes.

"By 8 p.m. Saturday evening we were confident everything was back to normal," Kane said.

"DCC personnel responded in an exceptional manner," Kane said. "They quickly sized up what had happened and what was going to happen."

Water didn't immediately reach the DCC, Kane explained, but the Bendix workers in charge of the complex recognized that the amount of water leaking in the hallway meant the area affected would expand. Within minutes, they started powering down the computers, and covering equipment with plastic stored nearby in case of storm damage. The precautions were completed by the time water reached the DCC.

"That allowed us to come back up as soon as we



Workmen use mops to remove water from the cable-laden area normally covered by floor tiles in the Data Computation Complex in Bldg. 30.

(Continued on page 2)

Bulletin Board

Cohen to speak to NMA on Aug. 24

JSC Director Aaron Cohen will speak to the JSC Chapter of the National Management Association on Aug. 24 at the Gilruth Recreation Center. The meeting begins with a social hour at 5 p.m., followed by dinner and the program at 6 p.m. Dinner cost is \$7. Reservations should be made by Aug. 18. For more information, contact Monica Kruest, x31419, or Marie McCright, x38413.

Graduate engineering courses expand

The University of Houston is expanding its capability to deliver graduate engineering courses to the Clear Lake community. Four courses will be taught this fall at the Clear Lake campus: ELEE 6335 Digital Control Systems, INDE 7397 Multiple Objective Optimization/Goal Programming, INDE 6332 Engineering Project Management, and MECE 6343 Boundary Layer Theory. In addition, three courses will be taught in JSC's Bldg. 45 through an interactive television network: MECE 6351 Finite Element Methods in Engineering Science, ELEE 6337 Introduction to Stochastic Processes, and ELEE 6342 Digital Signal Processing. Registration is Aug. 17 and 18 from 10 a.m. to 7 p.m. at the University of Houston campus downtown. For more information, contact Diane DeTroye, x33071.

See solar eclipse in China

A solar eclipse visit to some of the great places in China is planned Sept. 17 to Oct. 3 by the JSC Astronomical Society. "It is even mostly tax deductible for people who would like to assist with experiments being conducted during the brief eclipse on Sept. 23," said Paul Maley, organizer. Cities to be visited include Shanghai, Beijing, Taiyuan, Xian, Guilin and Hong Kong. For more information, call Maley, x34636.

Foreign language classes offered

Foreign language classes will be offered in September by the University of Houston-Clear Lake. French, German and Russian will be taught on a non-credit basis through the Office of Continuing Education, with an emphasis on conversational skills. Classes will meet weekly for an hour and a half. The seven-week session starts Sept. 8. Students should register by mail prior to the first class. To receive registration materials and a brochure outlining the foreign language program, call 488-9315.

Bowling league season begins Sept. 1

The NASA Mixed Bowling League's 1987-88 season begins Sept. 1. The league meets Tuesdays at 6 p.m. at Alpha Bowl on Bay Area Blvd. for 35 weeks. Cost is \$7 per person for the season, plus a small additional fee to go toward prize money. For more information, call Leonard Schmitt, 280-1692, or Leona Kain, 282-2544.

Gilruth Center News

Call x30304 for more information

Weight safety — The weight safety class will be held on Aug. 20 in the weight room from 8 to 9:30 p.m. This class is required for use of the weight room, and costs \$4.

Defensive driving — This course is offered Sept. 19 from 8 a.m. to 5 p.m. The cost is \$20.

Summer Sizzler softball tournament — The tournament will be held Aug. 22 and 23 and will be a men's Open C. Rainout dates are Aug. 29 and 30. The entry deadline is Aug. 19 and registration is \$95. Team and individual prizes will be awarded for 1st through 3rd places.

Country and western dance — Class will begin Sept. 14 and continue every Monday night from 7 to 8:30 for six weeks. The cost is \$20 per couple.

Mixed soccer league sign-ups — NASA badged teams will sign up Wednesday, Sept. 2 at 6:30 p.m. Non-NASA badged teams will sign up on Tuesday, Sept. 8 at 6:30 p.m.. Limit of nine teams per league.

Men's flag football sign-ups — NASA badged sign up will be Thursday, Sept. 3 at 6:30 p.m., while non-NASA badged sign-up will be on Thursday, Sept. 8 at 6:30 p.m. Limit of nine teams per league.

Cookin' in the Cafeteria

Week of August 17 — 21, 1987

Monday — Cream of Chicken Soup; Beef Burgundy over Noodles, Fried Chicken, BBQ Sausage Link, Hamburger Steak (Special); Buttered Corn, Carrots, Green Beans. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

Tuesday — Beef Noodle Soup; Baked Meatloaf, Liver & Onions, BBQ Spare Ribs, Turkey & Dressing (Special); Spanish Rice, Broccoli, Buttered Squash.

Wednesday — Seafood Gumbo; Broiled Fish, Tamales w/Chili, Spanish Macaroni (Special); Ranch Beans, Beets, Parsley Potatoes.

Thursday — Navy Bean Soup; Beef Pot Roast, Shrimp Chop Suey, Pork Chops, Chicken Fried Steak (Special); Carrots, Cabbage, Green Beans.

Friday — Seafood Gumbo; Broiled Halibut, Fried Shrimp, Baked Ham, Tuna & Noodle Casserole (Special); Corn, Turnip Greens, Stewed Tomatoes.

Week of August 24 — 28, 1987

Monday — Chicken Noodle Soup; Wieners & Beans, Round Steak w/Hash Browns, Meatballs & Spaghetti (Special); Okra & Tomatoes, Carrots, Whipped Potatoes. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

Tuesday — Beef and Barley Soup; Beef Stew, Shrimp Creole, Fried Chicken (Special); Stewed Tomatoes, Mixed Vegetables, Broccoli.

Wednesday — Seafood Gumbo; Fried Perch, New England Dinner, Swiss Steak (Special); Italian Green Beans, Cabbage, Carrots.

Thursday — Cream of Chicken Soup; Turkey & Dressing, Enchiladas w/Chili, Wieners & Macaroni, Stuffed Bell Pepper (Special); Zucchini Squash, English Peas, Rice.

Friday — Seafood Gumbo; Baked Cod, 1/4 Broiled Chicken w/Peach Half, Salisbury Steak (Special); Cauliflower au Gratin, Mixed Vegetables, Buttered Cabbage, Whipped Potatoes.

AT BUILDING #3

On Wednesday we feature The Reuben: Corned Brisket, Swiss Cheese on a bed of Sauerkraut, Poupon Mustard on Rye and 1/4 Pickle. Delicious!

Monday and Thursday check out our French Dip Sandwich.

Power-up verifies modifications

(Continued from page 1)

reevaluating Shuttle system failure modes and effects analysis (FMEA) and critical items list (CIL). Colonna said that following completion of the FMEA/CIL reevaluation, flight waivers required for the criticality 1 items will be presented to top NASA management for approval.

Some of the mandatory changes being made to *Discovery*, *Atlantis* and *Columbia* include: A redundant feature on the orbiter 17-inch disconnect that would prevent the valve from closing prematurely during powered flight; a device that would detect overheating and prevent a burn through of the Reaction Control System (RCS) primary thruster; an upgraded and improved brake system that includes a stiffer axle and larger stators; and a jettisonable hatch for rapid crew egress during stable, gliding flight below 20,000 feet in the event of an emergency.

The initial power-up in the Orbiter Processing Facility at KSC is designed to test some of these Orbiter

modifications. The tests will last into September, when the processing flow leading to the next launch will begin. Installation of additional modifications will continue into next year.

"This power-up is to verify the systems that were modified as a result of the extensive design reviews that have been conducted in the last year," Sieck said. "From a program standpoint this has been an excellent team effort."

Test operations, according to John Hallmark, KSC's Lead Project Engineer for *Discovery*, consist of doing pre-power switch lifts and bus oscillation checks, powering up the main buses and panels and checking out the main instrumentation system. After coolant is present in the water and freon systems the individual units are powered up, he said.

Preparation of the main engines for STS-26 began with delivery June 30 of flight engine 2027 to the National Space Technology Laboratories for acceptance testing. Of the remaining two SSMEs that will

be used for STS-26, one has flown on three previous Shuttle missions accumulating more than 3,300 seconds of test certification and flight time and one has undergone more than 1,200 seconds of test time.

Flight certification testing of the three engines, plus a spare, will take about a month each, followed by incremental delivery to KSC. The engines will be integrated with *Discovery* early next year prior to stacking with the external tank and solid rocket boosters.

The STS-26 crew patch released Aug. 4 embraces four predominant themes: a new beginning, represented by a gold sunrise; a safe mission, represented by a stylized launch and plume; building on NASA's traditional strengths, shown by a red vector that symbolizes aeronautics in the original NASA insignia; and remembrance of their seven colleagues who died aboard *Challenger*, represented by the seven-starred Big Dipper. The patch was designed by artist Stephen R. Hustvedt of Annapolis, Md.

McBride heads congressional relations

Astronaut Jon A. McBride will become acting Assistant Administrator for Congressional Relations at NASA Headquarters on Sept. 1. He succeeds John F. Murphy who has been appointed Chief, Office of External Affairs, at Ames Research Center.

Reporting to the Associate Administrator for External Relations, McBride will be responsible for the agency's relationship with Congress. He also will provide coordination and direction to all Headquarters and field center communications with congressional support organizations.

Selected as an astronaut in August 1979, McBride's NASA assignments have included lead chase

pilot for the maiden voyage of the Space Shuttle orbiter *Columbia*; software verification in the Shuttle Avionics Integration Laboratory and capsule communicator for STS-5, STS-6 and STS-7. He was pilot of Shuttle Mission 41-G in October 1984.



Jon McBride

McBride, a Navy Captain and test pilot with over 4,800 hours of flying time, is a former fighter pilot with more than 64 combat missions. He was also the pilot of the Navy's famous "Spirit of '76" bicentennial-painted F-4J "Phantom" that performed in air shows across the country during 1976-1978.

McBride has been awarded the Defense Superior Service Medal, 3 Air Medals, the Navy Commendation Medal with Combat V, a Navy Unit Commendation, the National Defense Medal, the Vietnamese Service Medal and the NASA Space Flight Medal.

Shuttle-derived heavy launcher eyed

NASA has officially begun studying a heavy-lift launch vehicle that could use the engines, solid rocket boosters, external fuel tank and launch facilities of the Space Shuttle. The Shuttle Orbiter could be replaced by an unmanned cargo element.

The chief purpose of the study is to determine whether the vehicle — tentatively known as Shuttle-C (for cargo) — would be cost effective in assembling and operating the Space Station.

Results of the Shuttle-C efforts

will be integrated with the joint NASA/Air Force modular Advanced Launch System (ALS) studies already under way.

The studies will enable a joint NASA/Department of Defense steering group to formulate national heavy-lift vehicle strategy that may best accommodate both near term requirements, such as Space Station assembly and longer term objectives for reduced space transportation costs.

The NASA-led Shuttle-C study will include Air Force participation

and concentrate on minimum modification of existing systems and facilities to minimize vehicle development cost and schedule risk, and to assure payload compatibility with the existing Space Shuttle payload environment. The Air Force-led ALS study, which includes NASA participation, concentrates on systems incorporating advanced technologies.

The availability of such a vehicle for Space Station assembly would free the Space Shuttle for increased work in all the sciences.

Board probes leak

(Continued from page 1)

did," Kane said. A detailed visual inspection performed the night after the accident showed that few computer cabinets had water on them and that no main processor units had any contact with water, Kane said.

An internal JSC investigation board has been created and is expected to submit a report within 60 days, said James Moore, chairman. The board includes representatives from the Safety, Reliability and Quality Assurance, Engineering, Mission Support, Center Operations and Mission Operations Directorates, he said.

Co-workers raise funds for Herbek legal fees

A group of current and former JSC employees are attempting to raise funds to help Flight Controller David Herbek and his family pay legal fees incurred before he was cleared of bank robbery charges.

Herkbek incurred almost \$43,000 in defense costs before he was notified by a Harris County grand jury.

Contributions may be sent to the JSC Federal Credit Union, Attn: Herbek Fund, Box 58346, Houston, TX, 77258. Contributions may be hand-carried to the Credit Union at 1330 Gemini, and should be given to Lana Rowden.

Donations will be accepted through the end of October.



Left to right: Diane DeCaix, James McMahon, George Parma, Chris Lichtenberg

Four earn JSC Fellowships

Four JSC employees have been selected to receive JSC Fellowships that allow them to pursue graduate studies full-time for one year while retaining their pay status.

Diane DeCaix, a Flight Controller in the Mission Operations Directorate, will work on a master's degree in Electrical Engineering at the University of Colorado.

Chris Lichtenberg, an Electronics Engineer in the Engineering Direc-

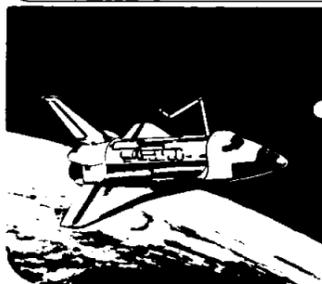
torate, will return to the University of Houston to finish his master's in Electrical Engineering.

James McMahon, a Structural Engineer in the Engineering Directorate, will work toward his doctorate in Mechanical Engineering at Rice University.

Georga Parma, a Mechanical Engineer in the Engineering Directorate, will work on a master's in Mechanical Engineering at Stanford University.

NASA
Lyndon B. Johnson Space Center

Space News Roundup



The **Roundup** is an official publication of the National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Texas, and is published every other Friday by the Public Affairs Office for all space center employees. **Roundup** deadline is the first Wednesday after publication.

Editor: Brian Welch
Assistant Editor: Kelly Humphries



Participating in a cantaloupe "sensory evaluation" are (left to right): Dr. Charles Bourland, NASA food scientist, Vickie Kloeris, Krug Intl., Selina Ahmed, summer faculty fellow, Maureen Aragon, Lockheed, and Beverly Thurmond, NASA food scientist.

FOODS for the FUTURE

Food lab's creations should make Space Station crews ask for seconds

By Billie Deason

The Manned Systems Division has opened a new space food development kitchen in Bldg. 17 for continued development of Space Shuttle and Space Station cuisine.

July 1 marked the grand opening of the new food laboratory that features a test kitchen and dedicated rooms for food processing, freeze drying, food packaging, hardware testing and package fabrication and storage.

The evolution of the food system for Space Station will be the primary task carried out in the updated food lab, the culmination of two years of planning by the Flight Systems Branch. The previous food lab area in Bldg. 37 has been converted to working space for Medical Sciences Division personnel.

The focal point of the new laboratory is an attractive and efficient test kitchen. The kitchen will serve as a crew training facility and a work area for food evaluation and demonstration. After consultation with an architect, who worked out the room arrangement, Space Station food scientist Beverly Thurmond worked with a kitchen designer to develop the layout of cabinets, appliances, work surfaces and serving areas.

Standard home-sized built-in appliances optimize the preparation and demonstration of both Shuttle and Space Station food products. Flexibility in the kitchen design will allow the facility to be modified to meet future needs, Thurmond said.

Institutional-sized equipment can be used for batch processing of raw food products. Freeze drying equipment has been retained in the lab as an additional evaluation tool. Prototype plastic food

containers can be thermo-formed in the lab for evaluation, and Shuttle food system packaging and hardware can be tested. Actual processing and packaging of Shuttle menus is handled by Boeing under the Flight Equipment Processing Contract (FEPC).

A recent product of the food development laboratory is a new package for Shuttle food system beverages. Instead of the molded plastic drink container that could not be compacted for disposal, a 12-ounce film and foil laminate envelope was designed. The envelope folds flat until water is added. After the beverage is consumed, the package can be refolded for disposal. The new packaging uses the same septum adapter and straw as the older version. The new beverage container is planned for evaluation on STS-26.

A primary emphasis for Space Station food is acceptability. Crew mealtimes will probably become an important daily social event, and much consideration is being given to providing a positive effect on crew morale. Ethnic foods for special occasion dinners are another possibility for variety in the Space Station menu.

Also proposed are experiments with new techniques in baking so that breads, cakes, brownies, and other popular desserts could be baked onboard for recreation and special occasions.

"Making the preparation and cleanup of meals as easy and time-saving as possible will encourage crew members to eat nutritious foods, yet have minimal impact on work schedules," Thurmond said.

Space Station crews will use a thermo-formed plastic tray with two elongated slots for individual food containers. The prototype was manufactured by JSC's Technical Services Division. Individual

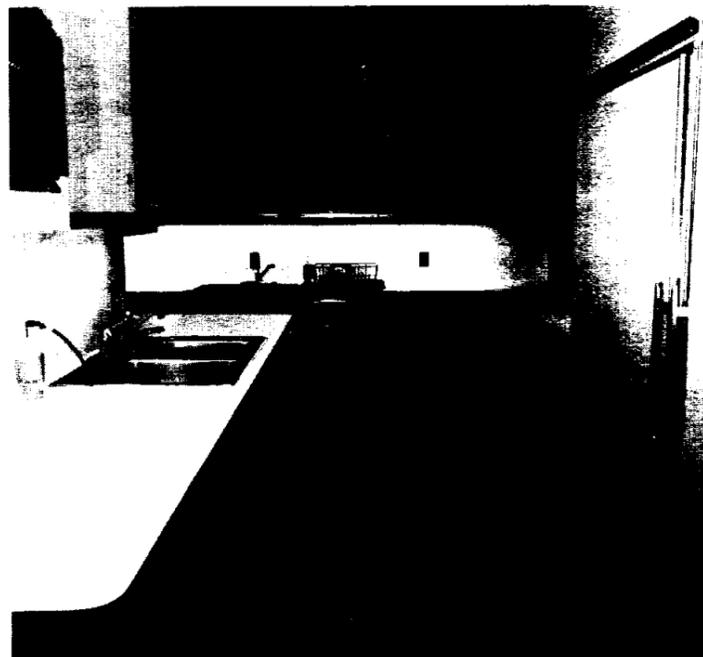
food serving containers will have varying depths and lengths to accommodate different food sizes and shapes.

Using different sizes of serving containers is a change from the Shuttle food system that uses one common container, requiring all food to be cut or processed to fit the container. Metal utensils with small magnets in the handles will adhere to a metal strip under one edge of the food tray.

A judging process called sensory evaluation is used to screen all new products and ideas for the Space Station food system. Food is graded on appearance, color, odor, flavor and overall product quality.

Since there will be both a freezer and a refrigerator on the Space Station, a greater selection will be available to crew members. New products such as "shelf stable" foods, which require no refrigeration, also will play a role in Space Station menus. Over the next 10 years, Thurmond said she expects advances in technology of food preparation and storage techniques that can be adopted for Space Station.

One such advance is the packaging of fresh fruits and vegetables, which will allow Space Station crews to eat fresh produce for much of their several-month-long missions. By wrapping fruits and vegetables in film wrap and injecting a gas mixture inside the package, shelf life of fresh produce can be greatly extended. There are no plans in early Space Station operations for crews to grow their own food. The food inventory will be managed by the same computer system that monitors all inventoried items on the Station.



The new food lab's efficiency kitchen (above) utilizes built-in appliances and counters and cabinets devoid of raised surfaces to collect dirt. The dining area (left) is nearby and provides a comfortable place to conduct taste tests.

Roundup Swap Shop

All Swap Shop ads must be submitted on a JSC Form 1452. The forms may be obtained from the Forms Office. Deadline for submitting ads is 5 p.m. the first Wednesday after the date of publication. Send ads to Roundup, AP3, or deliver them to the Newsroom, Bldg. 2 Annex, Room 147. No phone in ads will be taken.

Property & Rentals

Sale: Lake Livingston hwy frontage lot, wooded, in Paradise Acres, on FM 356, 8941.5 sq. ft. or .205 acre, Roger, x30093 or 472-5650.

Lease: CLC 2-2 condo, W/D connections, near daycare, pools, 2 weeks free, \$330/mo. plus deposit. 280-9822.

Lease: CLC 2-1 condo, security, pool, tennis, \$400/mo. plus utilities. 480-5583 or 482-7156.

Sale: League City 3-2-2, landscaped, new paint, FPL, fenced, near school, pool, tennis, 9.5 fixed FHA, low equity. David, x35464.

Lease: CLC Baywind II 1 BR, upstairs, parking space, drapes, new carpet, FPL, all kitchen appliances, W/D, tennis, adult pool, \$295/mo 488-5019.

Lease: CLC/Camino South 4-2-2d, fenced, A/C, carpeted, no pets, references, deposit required. 488-1301.

Lease: Bacliff Villas 3-1-1a, A/C, fenced, no pets, references, deposit required. 488-1301.

Rent: 2 BR apartment, Barringer Lane, Webster area, W/D hookup, storage, families welcome, \$330/mo., \$50 deposit. 996-8113.

Sale: Miramar/Seabrook 3-2-2, new roof, indoor paint, fans, FPL, fenced, beside fishing pond, dog run, 12 min. from JSC, \$54,900. Ed Irvin, 486-9770.

Lease: 3-2 Frenchman's Creek townhome w/2 car garage, contemporary, FPL, vaulted ceilings, storage, \$625/mo. plus deposit. 486-4466.

Rent: 2 BR vacation condo on Seawall Blvd., furnished, sleeps 6, Labor Day week, Sept. 5-12, \$750/wk. 486-4466.

Lease: League City 2 BR, fourplex, W/D, appliances, alarm, storage, covered parking, \$395/mo. plus deposit. Gordon, 481-3787 or x33269.

Lease: New Heritage Park 3-2-2 house, microwave, fans, garage dr. opener, drapes, near schools, NASA, shopping center, \$495/mo. V.A. Patel, 333-6449 or 480-2870.

Lease: Baywind II, split design, FPL, W/D, fans, stove, refrigerator w/ice maker, \$350/mo. plus \$150 deposit. Bill, x35169 or 480-2756.

Lease: Piper's Meadow 3-2-2, mini-blinds, FPL, stove, fans, refrigerator, \$550/mo., available 9/1. Mary Lou, x35129.

Sale: 4 Crystal Beach lots on Bolivar, each 50' x 100'. 921-7212.

Rent: Room, \$135/mo. Audrey, 485-9980.

Lease: Bay home, tri-level, trees, jacuzzi, FPL, decks, water view, \$700/mo. Mike, x33280 or 474-4805.

Sale: 1 acre lot, FM 517, 201 Leisure Lane, Santa Fe School District, sand, dirt, tractor work completed, \$9,000. Bill, x37953.

Sale: Lake Livingston, 70' x 176' water view, wooded lot in Resort Country S/D. Jerry, x39287.

Sale/Lease: Waterfront cottage, Lake Livingston, 80' pier, in Indian Hill Estates, owner finance. Jerry, x39287 or 554-6093.

Sale: Meadowbend 4-2-2, 1/3 acre in cul-de-sac, split BR, drapes, mini-blinds, garden, fruit trees, attic fans, fence, indoor utility room, assumable 10.5% FHA loan, \$71,900. Ann, x34475 or 538-3683.

Sale/Lease: South Pasadena 3-1.5-2, wood fence, mini-blinds, 1,100 sq. ft., near schools/shopping, \$44,000 or \$430/mo. 487-1654.

Sale: '85 2B/2B Sunrider mobile home, 14' x 70', on approx. 1/3 acre in Pearland, fenced, w/other extras, \$10,000 and assume payments OBO. 489-7645.

Lease: Scarsdale, between Baybrook and Alameda Malis, 3-1.5-2, brick, fenced, central A/H, ex. cond., \$450/mo. plus deposit. 482-1582.

Sale: '77 mobile home, set up at TAMU, 14' x 65', 2-2, central A/H, new carpet, \$9,500. Doug, x30964 or 480-2929.

Lease: League City/Countryside 3-2-2, fenced, drapes, \$525/mo. plus deposit. 482-3011.

Sale: League City/Countryside 3-2-2, fenced, drapes, \$2,900 down, assume \$46,000 10% VA PITI, \$594/mo. 482-3011.

Lease: CLC 2 BR condo, FPL, W/D connections, pools, all appliances, outside storage, \$350/mo. 486-0815.

Sale: Grapeland, Tx., 3-2-2 trailer w/carpport on 5 acres, set back from road, pine trees w/orchard, W/D, refrigerator, mid-30's. Frank or Pat, 488-6050.

Lease: CLC, 1 BR condos, choice of 2, microwave, fans, W/D connections, FPL, 2 weeks free, deposit. Jim, 282-1880 or 488-7901.

Rent: Room, 20 min. from NASA, wooded area, unfurnished, male or female, includes utilities, W/D, microwave, hot tub, cable TV, \$225/mo. Rowena, x31670 or 996-9249.

Rent/Lease purchase: 2 BR condo in Austin, fans, microwave, CF, new carpet/paint, pool, laundry facilities, shuttle bus, water/gas paid, \$375/mo. 482-7910.

Lease: Dixie Hollow/Pearland 3-2-2, fans, inside utility room, refrigerator, new paint, \$495/mo. 482-6609.

Lease: Forest Bend/Friendswood 3-2-2, fenced, patio, new paint, refrigerator, \$450/mo. 482-6609.

Lease: 2-2.5 University Trace townhouse, available 9/1, covered parking, fans, \$450/mo. plus electricity and deposit. Steve, x38126 or 488-2094.

Sale: '85 Mallard motor home, 35', like new, low mileage, loaded, \$13,000 and assume note or \$47,000 cash. D. Earl, 824-6009.

Sale: Middlebrook 3-2-2, new A/C, FPL, backed up to pine forest, assume \$73,000 loan, no down payment. Mike, 280-8566 or 333-4149.

Lease: West Galveston Island beach house, 3-2, furnished, day/week. Ed Shumilak, x37686 or 482-7723.

Sale: Friendswood/Forest Bend 3-2.5 townhouse, den, corner lot, storage, pool, \$43,500. 333-2322.

Lease: Friendswood/Forest Bend 3-2-2d, 1,800 sq. ft., both formals, den w/FPL, A/C, ex. cond., corner lot, available 8/30, no pets, \$525/mo. plus deposit. Sally, x37286 or 488-5501.

Lease: El Dorado Way 1-1-1CP condo, W/D, appliances, fans, FPL, upstairs, \$300/mo. Joyce, x33148 or 337-3038.

Sale: Piper's Meadow 3-2-2, fenced, FPL, fans, mini-blinds, 1 block from park, pool, assumable, \$5,000 equity, or \$59,900. 488-2879.

Lease: Scarsdale 2 BR on Sage Creek, cathedral ceiling, fenced, \$465/mo. plus \$150 deposit, w/option to buy. 484-6559.

Rent: Friendswood 3-2-2 house, furnished, available in September, 15-20 min. from NASA, \$510/mo. plus utilities. Joe, x39233.

Sale/Lease purchase: 5-2 expanded ranch house, 15 min. to JSC, 1 block to elem. school, park, \$69,900. Ken, 282-2406 or Cathy, 996-0027.

Sale: 3-2-2 Meadowgreen, ex. cond., study, fenced, all brick, \$78,900. 486-9224.

Lease: 3-2-2 in NW Houston, mini-blinds, fans, some appliances, near malls. Joe, 591-8809.

Sale: Wooded lot to golfer or fisherman only, Wildwood S/D, 120 mi. from CL, near Woodville, landing strip nearby. John Boyd, x33514 or 862-4365.

Cars & Trucks

'79 Olds Cutlass station wagon, good cond., new tires, stereo cassette, \$2,200. 280-9822.

'77 Chevy station wagon, A/C, tires, transmission, starter, alternator and upholstery, good cond. \$2,200 OBO. Gerry, 488-0527.

'79 Chevy K-5 Blazer, 2 wheel drive, 350 cu. in., 67K mi., tow pkg., \$3,000. Terry, x38649 or 332-5177.

'79 Ford LTD, PS, PB, AM/FM, A/C, 71K mi., good cond., \$1,400. Linda, 488-3742.

'59 Mercedes-Benz 220S, \$2,700 OBO. David, x35464.

'74 Toyota Land Cruiser, hard top, new tires, good running cond., \$2,700. Mike, 474-4712.

'63 Chevy 2-dr., 63K mi, second owner, ex. cond., BO. Smith, x31552 or 471-2419.

'84 Pontiac Grand Prix, V-8, PS, PB, PW, PL, PS, cruise, tilt, landau, wire wheels, 43K mi., \$5,900. Dana, x38629.

'78 Datsun 200 SX, good working cond., 5-sp., AM/FM, \$1,305. Victor, 282-3216 or 334-2335.

'83 Pontiac Firebird SE, ex. cond., T-tops, loaded, luxury and performance pkgs., \$6,500 OBO. Jim, 486-4083.

'72 Chevy Malibu, PS, PB, AM/FM cassette, good tires, clean, 55K mi., 4-dr., good cond. Nanci, x31460 or 480-7786.

'68 MGB, '54 Chevy pick-up. Jim, x35201.

'78 Mustang, 2-dr., \$675. 480-4404 or 480-2360.

'86 Grand Marquis, power everything, 1 owner, 10K mi., loaded, tinted glass, rust prevention, \$14,800. Kay, 282-3359 or 554-6073.

'79 Pontiac Firebird, runs well, BO. James, 486-4378.

'86 Ford F-150 pickup, 19K mi., A/C, 4-sp., dual tanks, tool box, hitch, \$8,000. Tom, 523-9933.

Light duty trailer, 4' x 8', 14" wheels, 1-7/8" coupling, \$150. Mike, 471-1844 or Cindy, x37175.

'84 Chevy S-10 pickup, ex. cond., loaded, \$6,500. Gary, x34090 or 480-5842.

'78 Camaro Z28, A/C, AM/FM cassette, 35K mi. on custom-built engine, 4-sp., \$2,000. Allen, x37042.

'82 Mercury Capri, 6 cylinder, automatic, A/C, AM/FM/cassette, tinted

windows, tires like new, ex. cond., 47K mi., \$3,700. Bob, x39079 or 488-5881.

'81 Pontiac Phoenix, 4-dr., good cond., \$1,200. Henry, 488-9005.

'81 Honda Prelude, 5-sp., sunroof, AM/FM/cassette, ex. cond., \$3,500. Cindy, x38849 or 488-1441.

'86 Jeep Cherokee 4 x 4, 4-dr., PS, PB, A/C, AM/FM/cassette, 2.8L V-6, auto. trans., cruise, ex. cond. Carol, x30611.

'59 Studebaker Lark, 2-dr., good cond., 6 cylinder flathead, 3-spd. standard, \$1,295 OBO. 464-8694 or 530-7079.

'85 Ford LTD. Crown Victoria, loaded, ex. cond., 22,500 mi., \$10,800 or \$1,200 down and assume loan. 930-8710.

'78 Olds Cutlass Supreme Brougham, A/C, auto., AM/FM, CB \$1,100. James, x34115.

'73 Toyota Celica Hatchback, A/C, AM/FM stereo, good cond., \$1,100. Norris, x39027 or 488-2276.

Boats & Planes

'85 Wetbike, 60 hp., ride double or pulls skier. 488-6526.

16' ski boat, tow bar, 75 hp. Johnson, 4 new seats, new instruments, new carpet, trailer, \$2,900. Ben, 488-1326 or x31588.

'85 Renken 19'7" cuddy cabin, stereo, V-6 OMC I/O, drive on trailer, ex. cond., \$9,300. Mike, x33280 or 474-4805.

Larson 16' open bow, tri-hull boat, motor and trailer, motor needs ignition module, BO over \$850. Jerry, x39287 or 554-6093.

Pearson 26' sailboat, good sail inventory, sleeps 4 adults, comes w/slip and pool, \$11,000. Jerry, x34473 or 488-5671.

Hobie 16' catamaran, 2 sets of sails, trapeze harnesses and life jackets, \$1,700. John, x38988 or 482-6364.

18' catamaran, AMF TRAC sailboat w/trailer and extras, like new, \$3,650. 333-3056.

Eagle 63 radio-controlled model airplane w/KB .40 and Futaba 6-channel radio, ready to fly, extras, \$150. Nicolas, 486-4016 or 282-3307.

'78 Venture 25 w/trailer, main/jib/150 genoa, 7.5 hp. Honda, OB, sleeps 5, VHF/FM radio, bulkhead compass plus extras, \$4,700. Sally, 332-4690 or 480-8190.

Cycles

'86 Yamaha FZ 600, 3,400 mi., Yoshimura header, Michelins, plus other extras, workstand, \$2,500 OBO. Doug, 282-4702.

'83 Honda 650 Nighthawk, like new, \$1,100. Arthur, x36607.

Heald Super Tryke, 3-wheeler, roll bar, speedometer, tow bar, 8 hp. B & S motor, \$275. Tim, 482-6291 or x38592.

'84 Goldwing Interstate, less than 10K mi., some extras, \$4,150. 482-9773. Old dirt bike, Italian manufacture, doesn't run, free to anyone who'll haul it away. Mike, 326-2186.

'81 Honda CR 450R, never raced, new RE-BOVC, new parts, like new, extras, \$750. Nicolas, 486-4016 or 282-3307.

'80 Honda 750, custom model, low mileage, garaged, mag wheels, \$1,450. Chuck, x30092 or 481-3637.

'85 Honda Interceptor, 500 cc., 1,400 mi., matching Arach helmet, \$2,250 OBO. John, x36484 or 486-1186.

Audiovisual & Computers

Z80-based computer, 2 drives, monochrome monitor, Wordstar, Multiplan, DRGraph, BASIC, \$350. Jim, x34608.

"Orbiter" Shuttle simulator software for IBM PC XT/AT, newest version, manual included, \$40 OBO. Debbie, x36706.

Apple IIe, 128K, monitor, 2 drives, Systemsaver, Grappler, printer interface, \$650. 334-1934.

Bigboard computer, dual 8" disk drives, monitor, keyboard, \$450. 334-4894.

Apple IIc, 640K, ZRAM CPM, 2 disk drives, Gemini 10X printer, monochrome monitor, Hayes 1200 modem, Mach II joystick, clock, over 100 floppies of software, \$1,995 OBO. Anthony, 280-1564 or 482-4156.

Compaq portable, 256K, 2 floppy disk drives, 1091 Panasonic printer, software, BO. 488-3191.

HP Digital cassette drive for HP-41C w/HP-IL interface module, ex. cond., \$450. Carlos, x38879 or 554-7727.

Networking pkg. for Commodore: VIDTEX binder, disk software, manual and Cheat Sheet, Compuserve Net user's guide, "How To..." text, Almanac, charts, etc., \$35; Westridge Communications 300 baud modem, \$25. Samouce, x35053.

Apple II+, 64K RAM, 2 drives, printer, color monitor, joysticks, paddles, soft-

ware (business and games), will sell separately, \$800 OBO. Pat, 486-2161.

T1 99/4A computer, extended Basic, games w/manuals, seldom used. 488-2822.

Household

Whirlpool Side by Side refrigerator, 19.1 cu. ft., gold, \$200; Couch and loveseat, white, good cond., may need cleaning, \$75. 332-0492.

Full-sized bed w/walnut headboard, frame, box springs and mattress, \$200 OBO. 488-4741 or 332-1377.

Washer and dryer, GE, apartment-sized, w/dryer wall mount kit, \$100 OBO. Jay, 282-4175.

Kelvinator frostless refrigerator, 19 cu. ft., icemaker, good cond., green, \$200. Ethel, x36148 or 332-5830.

Sensaphone Home Monitoring System, connects to phone, continuous scan for power failures, extreme high or low temp., unusual sound, 3 other cond. of your choice, retail \$250, BO. Roberto, x30778.

Sofa bed, fair cond., brown/beige, Herculon, new mattress. Gail, x39838.

Breakfast table, 4 chairs, table all wood, octagonal, 48" diameter, w/2 leaves, ex. cond., \$300. 333-3254.

Rocking chair, early American, needs upholstery work, \$15. 334-4894.

King-sized bed set, 3-piece. BO. Valerie, 36540.

King-sized waterbed, solid oak platform, 4 drawers, oak nightstands, light bridge, Morgan Gold baffled mattress, all ex. cond., 3 yrs. supply of chemicals, \$1,800. Brian, x38648 or 480-5194.

Oster kitchen center, 12 speeds, 5 appliances in one, blender, stand mixer w/4 qt. and 1.5 qt. bowls, food grinder, heavy duty doughmaker and salad maker, like new. 488-2822.

Kenmore vacuum cleaner, canister type, complete, ex. cond. \$50. Carlos, x38879 or 554-7727.

Gas dryer, Maytag, 6 yrs. old, ex. cond., \$150 or trade for electric dryer of equal value. Beth Ann, 333-6191.

Sofa, loveseat, rocker chair, ottoman, coffee table, 2 end tables and lamp, \$300 OBO. Cynthia, x31635 or 998-7396.

Sofa, loveseat and chair, 18 mos. old, like new, must sell, \$200 OBO. Joe, 282-3266 or 591-8809.

Ceiling fan, brass/walnut w/cane, 52", ex. cond., \$40. Bea, x33626.

Pets

Cocker spaniel, buff-colored male, 5 yrs. old, free to good home. x38961 or 944-6457.

3 kittens ready for good homes, 2 females, 1 male, litterbox-trained, free. Robert, x32809 or 480-3052.

Free puppies, born 7/24, Sire: registered choc. Lab. Linda, x35969 or 332-2469.

Golden Retrievers, AKC registered, 2 males, 10 yrs. old, free to good home. Earl, x32988 or 326-2354.

2 cats, 4 kittens, free to good home. 339-3060.

Musical Instruments

Premier snare drum set, includes bells, ex. cond., \$150. Marv, 488-3647 or x38312.

Stradivarius violin, copy, very old, ex. cond., stored in original case, bow has been restrung; 2 old accordions, ex. cond. Erwin, 485-9796 or Ethel, x36148. Peavey Deuce 120 w. guitar amplifier, ex. cond., \$325. Steve, x38126 or 488-2094.

Holton nickel-plated trumpet, case, supplies, mouth-pieces, good cond., \$100. Brian, x38648 or 480-5194.

Wanted

Want NASA memorabilia, serious collector. Gene, 476-9080.

Contraband is looking for a few good musicians, 21-piece stage band has opening for saxophone player. Bob, x34468 or 486-7687.

Want toddler's booster seat, desk, tricycle; twin bed w/bookshelf and/or drawers, all in good cond. Jeff, x38312 or 482-5393.

Want new or used FX-85 Epson printer w/manuals. Sue, x34008 or 482-9408.

Want non-smoking male roommate to share 4-2-2 house 10 min. from JSC/STSOC, \$200/mo. plus 1/3 utilities. Victor, 282-3216 or 334-2335.

Want single mother to share country home w/same, 2-1, den upstairs, share kitchen, \$350/mo., bills paid. Barbara, x37714 or 409-925-7405.

Want to trade '85 Mallard 35 ft. motor home for 4-2-2 single floor home in CL area. D. Earl, 824-6009.

Want licensed amateur radio operator who can administer tests for licensing. Carlos, x38879 or 554-7727.

Want washer/dryer, refrigerator, mulching lawn mower, weed eater, in ex. cond. Joey, x39233.

Miscellaneous

Ladies' solitaire diamond ring, .43 carats, platinum body, appraised at \$1,350, want \$700 firm, appraisal available; Pearson compound crossbow, 250 lbs. pull, leather belt pouch, 12 specially made pear-shaped hunting heads, want \$300 firm or will trade for Tamron 60-300 zoom lens in ex. cond. Harold, x38497 or 488-1044.

Entertainment cabinet, 68"x29"x16", \$20; Workbench, 3'x4'x2', w/vise, \$40; Computer table, 2.3'x4'x2', \$20. 332-0492.

Signature Freezer, large, upright, ex. cond., \$200. Marian, x34547 or 482-7019.